SYSTEMS AND METHODS FOR AUTOMATED IMAGE PROCESSING FOR IMAGES WITH SIMILAR LUMINOSITIES

INCORPORATION BY REFERENCE TO ANY PRIORITY APPLICATIONS

Any and all applications for which a foreign or domestic priority claim is identified in the Application Data Sheet as filed with the present application are hereby incorporated by reference under 37 CFR 1.57.

BACKGROUND

People with colorblindness (also known as color vision deficiency) have decreased ability to perceive and differentiate colors. Colorblindness may be caused by a mutation that may result in a cone partially or fully overlapping with another cone, which may affect multiple cones. In some cases, a person may be missing one or more cones. The three types of color sensing cones in the eyes include short-wavelength S cones, medium-wavelength M cones, and long-wavelength L cones. In a digital media application (such as a video game), people with colorblindness often cannot observe subtle differences between two objects when these two objects have similar luminosities. As a result, the ability to perceive and interact with the content of the digital media application may be negatively affected.

SUMMARY OF EMBODIMENTS

The systems, methods, and devices of this disclosure each have several innovative aspects, no single one of which is solely responsible for various desirable attributes disclosed herein.

One embodiment discloses a method for automated image processing to improve visibility of colors having similar luminosities in a digital media application, the method comprising: under control of a computing device comprising a hardware processor configured to execute software instructions: identifying an image frame of a virtual environment in a digital media application; identifying an initial value of a contrast and an initial value of a brightness of the image frame; determining a Daltonization strength, a local contrast parameter, and a local brightness parameter of the image frame; adjusting the contrast and the brightness of at least a portion of the image frame based on the local contrast parameter and the local brightness parameter; applying a modified Daltonization process using, at least, the Daltonization strength to modify color values of the image frame, wherein the Daltonization process creates a modified image frame; adjusting the contrast and the brightness of at least a portion of the modified image frame to create an enhanced image frame; and generating instructions for rendering the enhanced image frame in the digital media application.

Another embodiment discloses a system for automated image processing to improve visibility of colors having similar luminosities in a digital media application, the system comprising: a hardware processor configured to execute software instructions configured to: identify an image frame of a virtual environment in a digital media application; identify an initial value of a contrast and an initial value of a brightness of the image frame; access a Daltonization strength, a local contrast parameter, and a local brightness parameter of the image frame; adjust the contrast and the brightness of at least a portion of the image frame based, at least in part, on the local contrast parameter and the local brightness parameter; apply a modified Daltonization process using, at least, the Daltonization strength to modify color values of the image frame, wherein the Daltonization process creates a modified image frame; adjust the contrast and the brightness of at least a portion of the modified image frame to create an enhanced image frame; and render the enhanced image frame within the digital media application; and generate instructions for display of the enhanced image frame within a graphical user interface of the digital media application.

Another embodiment discloses a non-transitory computer-readable medium having stored thereon a computer program, the computer program including executable instructions which configure a hardware processor to: identify an image frame of a virtual environment in a digital media application; identify an initial value of a contrast and an initial value of a brightness of the image frame; access a Daltonization strength, a local contrast parameter, and a local brightness parameter of the image frame; adjust the contrast and the brightness of at least a portion of the image frame based, at least in part, on the local contrast parameter and the local brightness parameter; apply a modified Daltonization process using, at least, the Daltonization strength to modify color values of the image frame, wherein the Daltonization process creates a modified image frame; adjust the contrast and the brightness of at least a portion of the modified image frame to create an enhanced image frame; and render the enhanced image frame within the digital media application; and generate instructions for display of the enhanced image frame within a graphical user interface of the digital media application.

Although certain embodiments and examples are disclosed herein, inventive subject matter extends beyond the examples in the specifically disclosed embodiments to other alternative embodiments and/or uses, and to modifications and equivalents thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

Throughout the drawings, reference numbers are re-used to indicate correspondence between referenced elements. The drawings are provided to illustrate embodiments of the subject matter described herein and not to limit the scope thereof

The patent or application file contains at least one drawing executed in color. Copies of this patent or patent application publication with color drawings will be provided by the Office upon request and payment of the necessary fee.

FIG. **1** illustrates an embodiment of rows of colors in an enhanced Daltonization view, a normal Daltonization view, and a normal undaltonized view.

FIG. **2** illustrates an embodiment of the view of FIG. **1** as perceived by a person with protanopia colorblindness.

FIG. **3** illustrates an embodiment of the view of FIG. **1** as perceived by a person with deuteranopia colorblindness.

FIG. **4**A illustrates an example embodiment of a screenshot of a video game as perceived by a person with protanopia colorblindness.

FIG. **4**B illustrates an example embodiment of the screenshot of FIG. **4**A as perceived by a person with protanopia colorblindness after post-processing executes an enhanced Daltonization technique.

FIG. **4**C illustrates an example embodiment of the screenshot of FIG. **4**A as perceived by a person with normal vision after post-processing executes an enhanced Daltonization technique.